



Making Shots Count

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Comparison of Morbidity



Comparison of 20th Century Annual Morbidity and Current Morbidity: Vaccine-Preventable Diseases

Disease	20 th Century Annual Morbidity [†]	2011 Reported Cases ^{††}	Percent Decrease
Smallpox	29,005	0	100%
Diphtheria	21,053	0	100%
Measles	530,217	222	> 99%
Mumps	162,344	404	> 99%
Pertussis	200,752	18,719	91%
Polio (paralytic)	16,316	0	100%
Rubella	47,745	4	> 99%
Congenital Rubella Syndrome	152	0	100%
Tetanus	580	36	94%
<i>Haemophilus influenzae</i>	20,000	14*	> 99%

[†]Source: JAMA. 2007;298(18):2155-2163

^{††}Source: CDC. MMWR August 17, 2012;61(32):624-637. (final 2011 data)

* *Haemophilus influenzae* type b (Hib) < 5 years of age. An additional 14 cases of Hib are estimated to have occurred among the 226 reports of Hi (< 5 years of age) with unknown serotype.

CDC/National Center for Immunization & Respiratory Diseases

Estimated Return on Investment of Childhood Vaccines



- For each birth cohort vaccinated against 13 diseases in accordance with the schedule for DTaP, Hib, IPV, MMR, HepB, Varicella, Hepatitis A, Pneumo-7, and Rotavirus vaccines:
 - *42,000 lives are saved*
 - *20M cases of disease are prevented*
 - *13.5 billion dollars in direct costs are saved*
 - *68.8 billion dollars in direct plus indirect (societal) costs are saved*
 - *For each dollar invested in these vaccinations \$10.20 is saved*



Why do we immunize when we do?

- To prevent vaccine-preventable diseases
- To establish herd immunity
- To provide protection for members of the youngest age group at risk for disease



Immunity & “Herd” Immunity



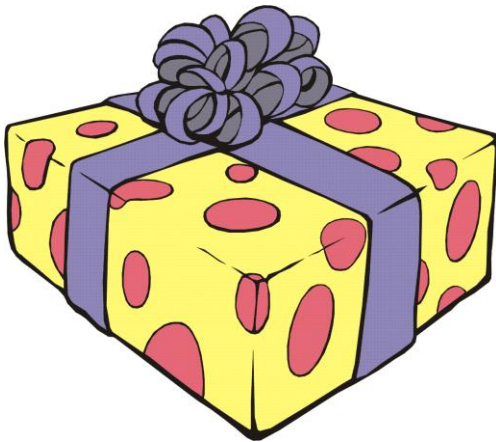
- **Immunity:**
 - Protection against a disease
- **Herd (community) immunity:**
 - “A situation in which a sufficient proportion of the population (herd) is immune to an infectious disease (through vaccination &/or prior disease) to make it’s spread from person to person unlikely.”

Two Types of Immunity



Passive Immunity

- Mother to Infant
- Blood Products
- Immune Globulin
- Temporary



Active Immunity

- Natural disease
- Immunization
- Long lasting





Definitions

- **ANTIGEN** - Live or Inactivated (killed) substance (germ) capable of producing an immune response
- **ANTIBODY** - Protein molecules produced by the body to help eliminate an antigen (germ)

Classification of Vaccines



- **Two basic types of vaccines**
 - Live attenuated vaccines
 - Inactivated vaccines

Live Vaccines



- Attenuated (weakened) form of the "wild" virus or bacterium
- Must replicate to be effective
- Immune response similar to natural infection
- Usually produce immunity with one dose*

*except those administered orally





Inactivated Vaccines

- Cannot replicate
- Different immune response (humoral)
- Unaffected by antibody in the blood
- Generally require 3-5 doses
- Antibody titer diminishes with time
- Adverse events mostly local with or without fever

Principles of Vaccination



■ General Rule #1

The more similar a vaccine is to the disease causing form of the organism, the better the immune response to the vaccine

Principles of Vaccination



■ General Rule #2

Inactivated vaccines generally are not affected by circulating antibody to the antigen.

Live attenuated vaccines may be affected by circulating antibody to the antigen.

Principles of Vaccination



- General Rule #3

All vaccines can be administered at the same time/visit as all other vaccines

Principles of Vaccination



■ General Rule #4

Increasing the interval between doses of a multi-dose vaccine does not diminish the effectiveness of the vaccine.

Decreasing the interval between doses of a multi-dose vaccine may interfere with antibody response and protection.



Contraindications & Precautions

- What is a Contraindication?
 - a condition in the patient which greatly increases the chance of a serious reaction.
- What is a Precaution?
 - a condition in the patient which may increase the chance or severity of a serious reaction, or that may affect the vaccine's ability to produce immunity.

Contraindications & Precautions



- **Three permanent contraindications to vaccines:**
 - Severe allergic reaction to a vaccine component, or following a prior dose.
 - Encephalopathy (brain swelling) without known cause within seven days of administration of a previous dose of DTP, DTaP or Tdap vaccine.
 - Severe combined immunodeficiency (rotavirus vaccine)
- **Two temporary contraindications to live vaccines**
 - Pregnancy
 - Immunosuppression

Contraindications & Precautions



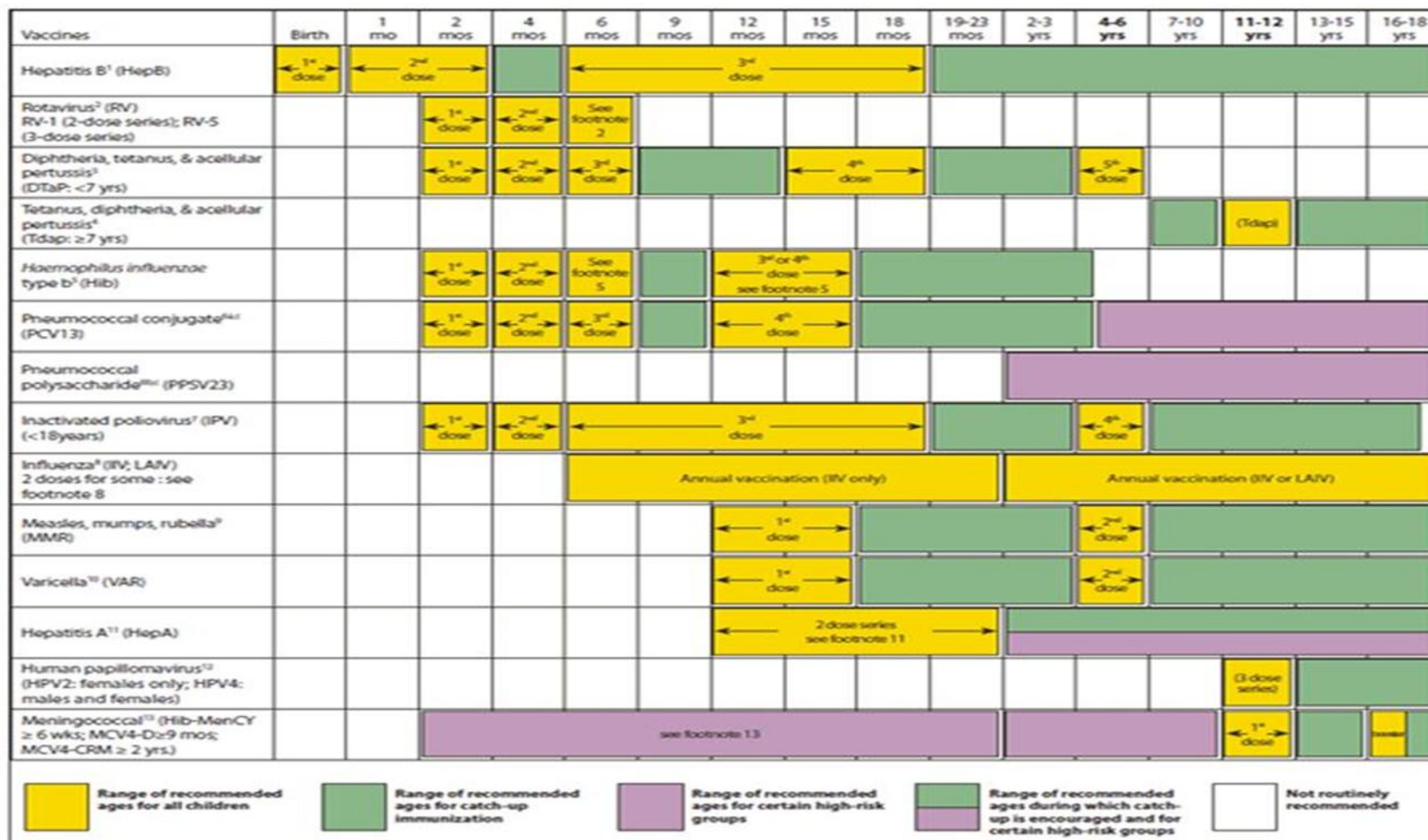
- Four conditions are considered precautions to further doses of DTaP vaccines only:
 - Temperature $>105^{\circ}$ F or higher within 48 hours after vaccination
 - Collapse or shock-like state within 48 hours of after vaccination
 - Seizure within 3 days after vaccination
 - Persistent, inconsolable crying lasting 3 or more hours occurring within 48 after vaccination



Invalid Contraindications

- Mild illness
- Antimicrobial therapy
- Disease exposure or convalescence
- Pregnant or immunosuppressed person in the household
- Breastfeeding
- Preterm birth
- Allergy to products not present in vaccine or allergy that is not anaphylactic
- Family history of adverse events
- Tuberculin skin test
- Multiple vaccines

2013 Recommended immunization schedule for persons aged 0 through 18 years





Minimum Ages / Intervals: Spacing Between Vaccine Doses

- Minimum age for receiving initial doses
- Minimum intervals between doses
- Grace period of 4 days for all vaccines includes initial doses and intervals between doses
- If dose of vaccine is given at a shorter interval (allowing grace period) - even one day shorter - it doesn't count as a valid dose
- Doses too close can reduce vaccine effectiveness



Prevent the most common interval errors !!!

- **Hep B**
 - At least 8 weeks between the last 2 doses
 - 3rd dose given at least 24 weeks of age and older
- **Rotavirus**
 - 6 weeks to 8 months
 - Must give 3 doses if vaccine brands are mixed
- **DTaP**
 - 6 months between 3rd and 4th dose
- **Influenza**
 - 2nd dose given 28 days after 1st dose for first time flu vaccine recipients
- **MMR and Varicella**
 - If not given simultaneously, 28 days spacing between doses

Combination Vaccines



- The use of licensed combination vaccines is preferred over separate injections
- When using combination vaccines follow the schedule for each vaccine in the combination



DO NOT MIX YOUR OWN VACCINES!



Vaccines for Pre-teens and Teens

Tdap



- Can give as young as 7 years of age if unvaccinated or incomplete DTaP series
- If unvaccinated, administer a primary Td series & substitute a 1-time Tdap for any dose in the series, preferably the 1st dose
- Should be given regardless of interval since previous Td
- Make special effort to give Tdap to children & teens in contact with infants younger than 12 months

Meningococcal Conjugate



- Give routinely at 11 through 12 years of age & a booster dose at 16 years
- Give to all unvaccinated teens 13 through 18 years of age & a booster dose at 16-18 years
- Give 1 initial dose to unvaccinated first-year college students 19-21 years of age who live in residence halls. Give booster dose if most recent dose given younger than 16 years

Human Papillomavirus (HPV)



- 2 HPV vaccines
 - Cervarix® (HPV2) – GlaxoSmithKline (GSK)
 - Gardasil® (HPV4) – Merck
- Give 3 dose series of either HPV2 or HPV4 to girls & 3-dose series of HPV4 to boys 11-12 year
- Schedule – 0, 1-2, 6 month schedule
- May be given as early as 9 years of age

Influenza



- 1 dose annually to persons 9 years and older
- Available formulations
 - Regular seasonal flu shot
 - High-dose flu vaccine for people 65 years and older
 - Intra-dermal flu vaccine for people 18-64 years
 - Nasal spray flu vaccine for healthy persons 2 through 49 years who are not pregnant

“I got the flu after receiving a flu shot!!!”



There are several reasons why this misconception persists:

- Less than 1% of people who are vaccinated with the injectable vaccine develop flu-like symptoms, such as mild fever and muscle aches, after vaccination. These side effects are not the same as having influenza, but people confuse the symptoms.
- Protective immunity doesn't develop until 1–2 weeks after vaccination. Some people who get vaccinated later in the season (December or later) may get influenza shortly afterward. These late vaccinees develop influenza because they were exposed to someone with the virus before they became immune. It is not the result of the vaccination.
- To many people "the flu" is any illness with fever and cold symptoms. If they get any viral illness, they may blame it on the flu shot or think they got "the flu" despite being vaccinated. Influenza vaccine only protects against certain influenza viruses, not all viruses.
- The influenza vaccine is not 100% effective, especially in older persons. For more information on this topic, go to:
 - www.cdc.gov/flu/professionals/vaccination/effectivenessqa.htm



Catch-up Vaccines

If incomplete or unvaccinated:

- **MMR –2 doses**
- **Varicella –2 doses. Persons 13 years of age and older receiving VAR for the first time should receive 2 doses spaced 4 weeks apart**
- **Hepatitis B – 3 doses**
- **Hepatitis A – 2 doses**
- **Polio – 4 doses. One dose after 4 years of age regardless of the number of doses before 4 years of age.**
 - (IPV is not routinely recommended for US residents 18 years of age or older)

Help Parents Keep Their Children Up to Date



- Talk to parents about the importance of vaccinating at proper intervals
- Follow the recommended schedule
- Encourage use of combination vaccines for maximum protection for their child



Vaccines for Adults



Recommended Adult Immunization Schedule—United States • 2013

Note: These recommendations must be read with the footnotes that follow containing number of doses, intervals between doses, and other important information.

Figure 2. Vaccines that might be indicated for adults based on medical and other indications¹

VACCINE ▼	INDICATION ►	Pregnancy	Immuno-compromising conditions (excluding human immunodeficiency virus [HIV]) ^{1,6,7,10,15}	HIV infection CD4+ T lymphocyte count ^{6,7,10,14,15}	Men who have sex with men (MSM)	Heart disease, chronic lung disease, chronic alcoholism	Asplenia (including elective splenectomy and persistent complement component deficiencies) ^{10,14}	Chronic liver disease	Kidney failure, end-stage renal disease, receipt of hemodialysis	Diabetes	Health care personnel
Influenza ^{2,*}			1 dose IIV annually		1 dose IIV or LAIV annually		1 dose IIV annually				1 dose IIV or LAIV annually
Tetanus, diphtheria, pertussis (Td/Tdap) ^{3,*}		1 dose Tdap each pregnancy	Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs								
Varicella ^{4,*}		Contraindicated					2 doses				
Human papillomavirus (HPV) Female ^{5,*}			3 doses through age 26 yrs				3 doses through age 26 yrs				
Human papillomavirus (HPV) Male ^{5,*}			3 doses through age 26 yrs				3 doses through age 21 yrs				
Zoster ⁶		Contraindicated					1 dose				
Measles, mumps, rubella (MMR) ^{7,*}		Contraindicated					1 or 2 doses				
Pneumococcal polysaccharide (PPSV23) ^{8,9}						1 or 2 doses					
Pneumococcal 13-valent conjugate (PCV13) ¹⁰						1 dose					
Meningococcal ^{11,*}						1 or more doses					
Hepatitis A ^{12,*}						2 doses					
Hepatitis B ^{13,*}						3 doses					

*Covered by the Vaccine Injury Compensation Program

- For all persons in this category who meet the age requirements and who lack documentation of vaccination or have no evidence of previous infection; Zoster vaccine recommended regardless of prior episode of zoster
- Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications)
- No recommendation

These schedules indicate the recommended age groups and medical indications for which administration of currently licensed vaccines is commonly indicated for adults ages 19 years and older, as of January 1, 2013. For all vaccines being recommended on the Adult Immunization Schedule: a vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Licensed combination vaccines may be used whenever any components of the combination are indicated and when the vaccine's other components are not contraindicated. For detailed recommendations on all vaccines, including those used primarily for travelers or that are issued during the year, consult the manufacturers' package inserts and the complete statements from the Advisory Committee on Immunization Practices (www.cdc.gov/vaccines/pubs/acip-list.htm). Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

The recommendations in this schedule were approved by the Centers for Disease Control and Prevention's (CDC) Advisory Committee on Immunization Practices (ACIP), the American Academy of Family Physicians (AAFP), American College of Physicians (ACP), American College of Obstetricians and Gynecologists (ACOG), and American College of Nurse-Midwives (ACNM).



U.S. Department of
Health and Human Services
Centers for Disease
Control and Prevention



Autism, Mercury, Alternate Immunization Schedules and other Vaccine Myths

- *“The Problem With Dr. Bob’s Alternate Vaccine Schedule”*
Paul Offit, MD. Journal of the American Academy of Pediatrics
http://www.immunize.org/concerns/offit_moser2009.pdf
- *“Clear Answers & Smart Advice About Your Baby’s Shots”* Ari Brown, MD, FAAP
<http://www.immunize.org/catg.d/p2068.pdf>
- *“Evidence Shows Vaccines Unrelated to Autism”*
<http://www.immunize.org/catg.d/p4028.pdf>
- *“MMR vaccine does not cause autism”*
<http://www.immunize.org/catg.d/p4026.pdf>
- *“Vaccine Concerns: Multiple Injections”* – Vaccine-Related Journal Articles
http://www.immunize.org/journalarticles/conc_multi.asp
- *“The Childhood Immunization Schedule: Why Is it Like That?”*
American Academy of Pediatrics. <http://www.aap.org/en-us/advocacy-and-policy/Documents/Vaccineschedule.pdf>



Additional References

- Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Atkinson W, Wolfe S, Hamborsky J, eds. 12th ed. Washington DC: Public Health Foundation, 2011.
- Centers for Disease Control and Prevention. *General Recommendations on Immunization: Recommendations of the Advisory Committee on Immunization Practices*. MMWR 2011:60 (No. 2). January 28, 2011.
- “Ask the Experts”
<http://www.immunize.org/askexperts/>

Questions?



Thank You !!!!!

